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Louis N. Bass

Iowa Agricultural Experiment Station

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Relationships of Temperature, Time and Moisture Content to the Viability of Seeds of Kentucky Bluegrass¹

By LOUIS N. BASS

Kentucky bluegrass seed is usually harvested at quite high moisture levels. The freshly harvested material is packed in burlap bags where it may remain a few minutes, a few hours, or a day or two. While in the bags, the green material may also be piled up or loaded on trucks for long hauls. The seedsmen who handle bluegrass seed have known for a long time that green seed will heat while in the bags, especially when the bags sit for a long time, but they did not know how long the green seed could be left in the bags without heating, what conditions promoted heating, or how long the green seed could be subjected to various temperatures without injury.

In 1916 Garman and Vaughan (1) studied the curing of Kentucky bluegrass seed and its effects on viability of the seed. They found that a prolonged exposure to 122° F. (50° C.) killed the seed.

The scope of this paper is confined to laboratory experiments to determine the relationships between the moisture content of the seed at harvest and the length of time required by a given temperature to bring about loss of viability. Seed was harvested in 1951 at four stages of maturity indicated by moisture contents of 54, 40, 22 and 11 per cent. The freshly harvested seed was brought into the laboratory where a portion of each collection was placed at each of the following temperatures: 20, 30, 40, 50, 60 and 70° C. in a closed container to prevent drying out. Another portion of each collection was dried at room temperature immediately after harvest to be used as a check for the various temperature treatments. Samples representative of each temperature treatment were taken 4, 8, 16, 24, 32, 40 and 48 hours after start of the experiment and dried rapidly at room temperature. Each sample was then hand threshed, cleaned and tested for germination. Four replicates of 100 seeds each were planted in petri dishes on quartz sand moistened with a solution of 0.1 per cent potassium nitrate. The petri dishes were placed in a germinator set for alternating temperatures

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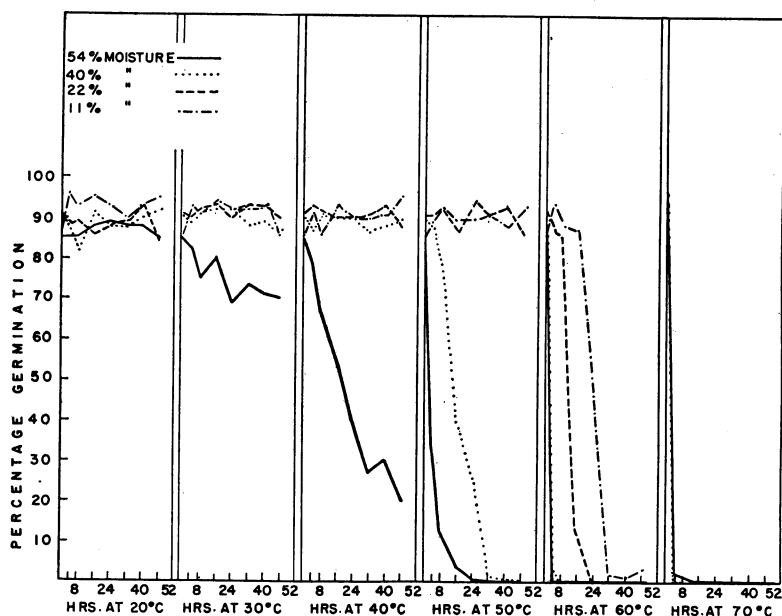


Figure 1. Effects of Time and Temperature on the Germination of Kentucky Bluegrass Seed Hand Harvested at Four Moisture Levels (1951 Crop).

of 15°C. night (15 hrs.) and 30°C. day (9 hrs.) with approximately 100 foot candles of light provided during the day for a period of 28 days for germination of the seeds.

Similar tests were made in 1952 except that only three collections, 44, 23 and 14 per cent moisture, were made and only three temperatures, 35, 40 and 45°C., were used. The procedures of sampling and germinating the seeds were the same as in 1951.

Figure 1 shows that 20°C. (68°F.) was a safe temperature for seed of all moisture levels studied. There was some loss of viability of the 54 per cent moisture seed after 24 hours at 30°C. (87°F.) and extensive loss after only 8 hours at 40°C. (104°F.). The 54 per cent moisture seed was rendered worthless in less than 4 hours at a temperature of 50°C. (122°F.) or above. Seed harvested at 40 per cent moisture withstood temperatures up to 50°C. (122°F.) for four hours without injury. Beyond this point however, loss of viability of the seed was very rapid. Seed harvested at 22 and 11 per cent moisture showed no deleterious effects at temperatures less than 60°C. (140°F.) and then only after 16 and 24 hours respectively.

Figure 2 shows that 45°C. (113°F.) was the only temperature used in 1952 which adversely affected germination of the seed and

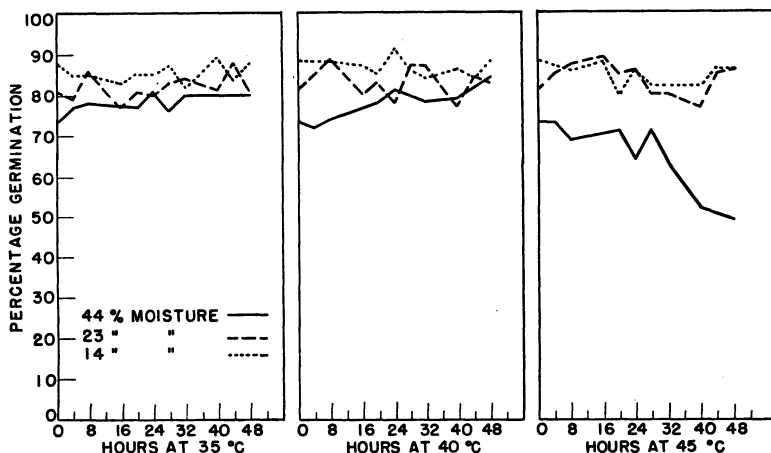


Figure 2. Effects of Time and Temperature on the Germination of Kentucky Bluegrass Seed Hand Harvested at Three Moisture Levels (1952 Crop).

that only after 40 hours exposure of seed harvested at 44 per cent moisture.

SUMMARY AND CONCLUSIONS

Loss of viability of Kentucky bluegrass seed by heating is correlated with the moisture content of the seed and the length of time it is held at a given temperature. The higher the moisture content of the seed, the lower the temperature and the shorter the time at that temperature required to bring about loss of viability. Temperatures as low as 30°C. caused loss of viability of Kentucky bluegrass seed harvested at 54 per cent moisture while seed harvested at 44 per cent moisture withstood a temperature of 45°C. for 36 hours without apparent injury. Seed harvested at 22 and 11 per cent moisture showed no loss of viability at temperatures below 60°C.

It is necessary to know the moisture content of the seed in order to determine a safe temperature maximum for Kentucky bluegrass.

Literature Cited

1. Garman, H. and E. C. Vaughn, The curing of bluegrass seeds as affecting their visability. Ky. Agr. Exp. Sta. Bul. 198, 1916 .

BOTANY AND PLANT PATHOLOGY SECTION
IOWA AGRICULTURAL EXPERIMENT STATION
AMES, IOWA